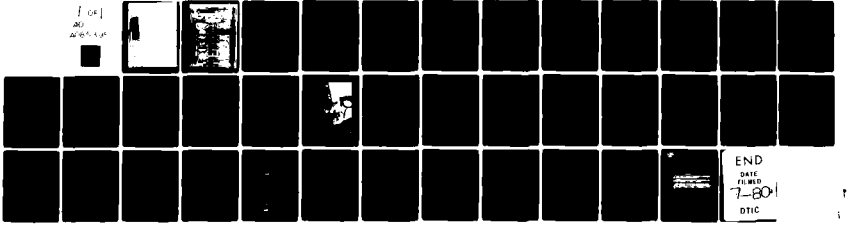
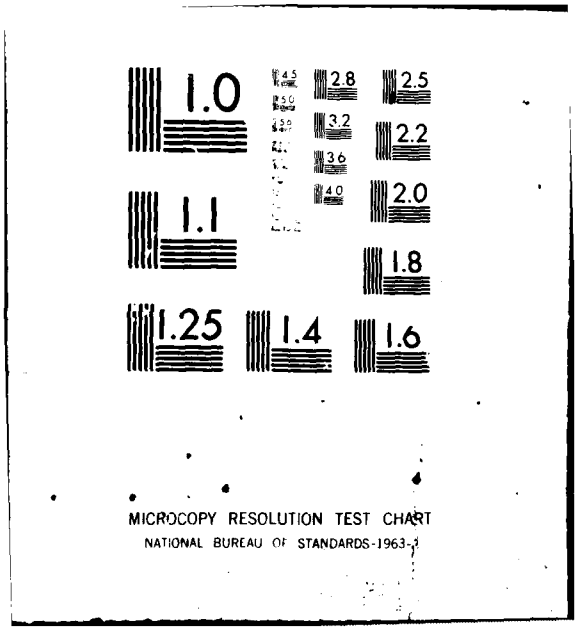
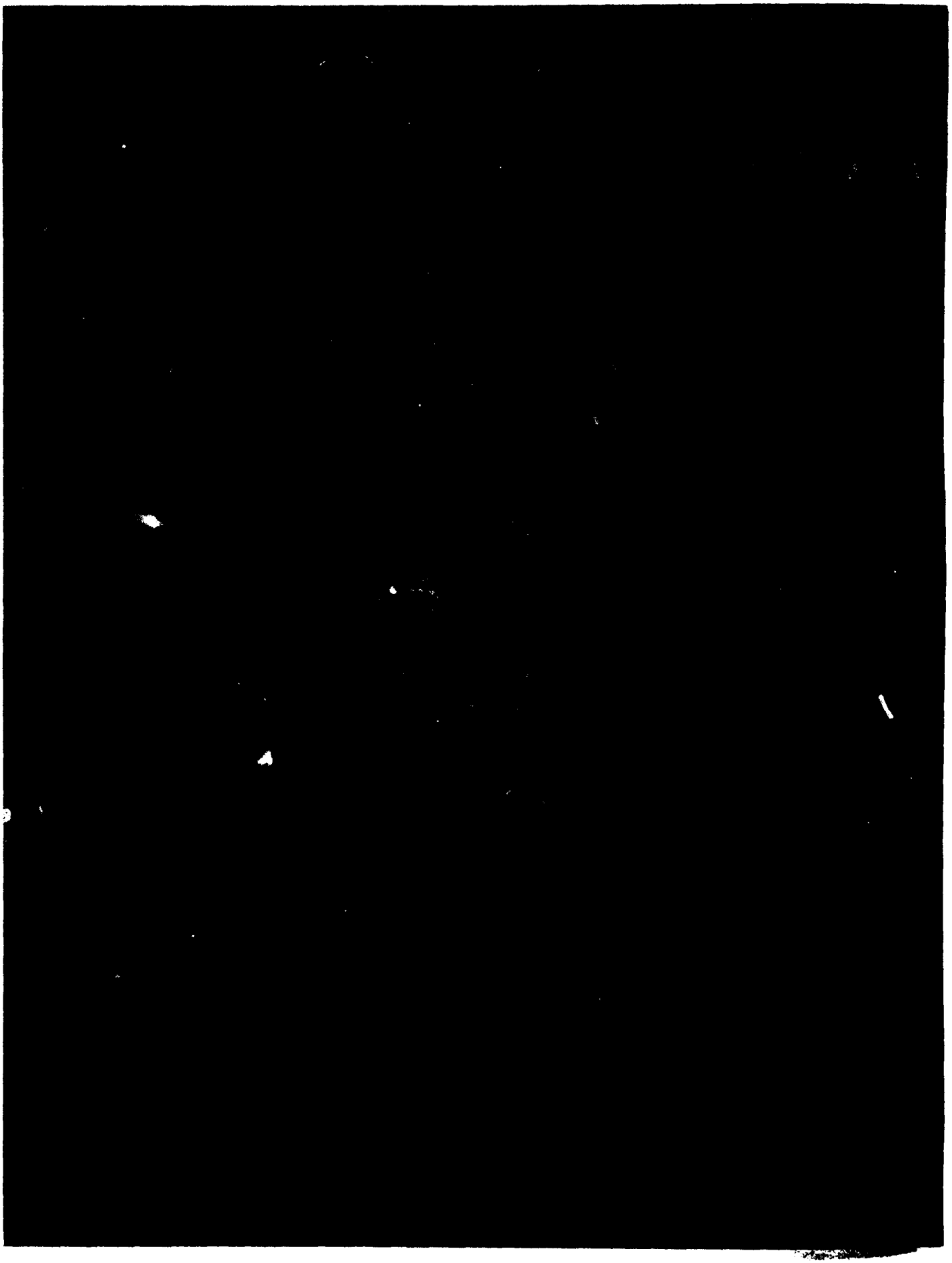
AD-A085 395 DAVID W TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CE--ETC F/G 15/5
AFLOAT INFORMATION AND MATERIAL MOVEMENT STUDY (AIMMS). PHASE 2--ETC(U)
MAY 80 B SIEGEL, C ASH

UNCLASSIFIED DTNSRDC-80/075 NL



END
DATE FILMED
7-80
DTIC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: DTNSRDC-80/075	2. GOVT ACCESSION NO.: AD-A085395
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): AFLOAT INFORMATION AND MATERIAL MOVEMENT STUDY (AIMMS). PHASE 2 - DATA ACQUISITION	5. TYPE OF REPORT & PERIOD COVERED: Interim Report, 1979
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Benjamin Siegel, Curtis Ash	8. CONTRACT OR GRANT NUMBER(s): F53531
9. PERFORMING ORGANIZATION NAME AND ADDRESS: David W. Taylor Naval Ship Research and Development Center, Bethesda, Maryland 20084	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 62760N; TF53531 091; 1-1800-007-64
11. CONTROLLING OFFICE NAME AND ADDRESS: Naval Supply Systems Command, Code SUP 043, Washington, D.C. 20376	12. REPORT DATE: May 1980
	13. NUMBER OF PAGES: 35
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): Naval Supply Systems Command, Code SUP 0341, Washington, D.C. 20376	15. SECURITY CLASS. (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Data Acquisition
Process Analysis
Supply Support

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The purpose of the Afloat Information and Material Movement Study (AIMMS) is to determine the relative locations (measured in time), equipment and manning requirements (configuration), of a new construction aircraft carrier supply support system that will maximize the effectiveness of the system during at-sea operations. The prime objective of the study is to develop a method that can be used as a tool for analyzing the effects on the system of adjusting the characteristics of the configuration.

(Continued on reverse side)

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-LF-014-6601

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

387682

(Block 20 continued)

Phase 1, the initial AIMMS effort, described the supply support and related maintenance processes performed by current aircraft carrier departments.

This Phase 2 report describes:

(1) the data acquired to quantify the required supply support processes,

(2) the measure of effectiveness to be used as a basis for evaluations, AND

(3) the potential systems that may be considered as substitutes for current inter- and intra-process means of information and material processing and transfer.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AD	-	Destroyer Tender
ADSDP	-	Automated Data System Development Plan
AFS	-	Combat Stores Ship
AIMD	-	Aviation Intermediate Maintenance Department
AR	-	Repair Ship
AS	-	Submarine Tender
ASCII	-	American Standard Code for Information Interchange
AVCAL	-	Aviation Consolidated Allowance List
AWP	-	Awaiting Parts
Baud	-	Unit of Signaling Speed
BCM	-	Beyond Capability Maintenance
BIT	-	Binary Digit
BYTE	-	Sequence of Adjacent Binary Digits Used as a Unit
CAG	-	Carrier Air Group
CASREPT	-	Casualty Report
CLAMP	-	Closed Loop Aeronautical Management Program
COD	-	Carrier Onboard Delivery
CONREP	-	Connected Replenishment
COSAL	-	Consolidated Shipboard Allowance List
CRT	-	Cathode Ray Tube
CV	-	Aircraft Carrier
DD 1348	-	Manual Requisition Form
DSPO	-	Division Supply Petty Officer
DTO	-	Direct Turn Over
ExRep	-	Expeditious Repair
GQ	-	General Quarters
ICRL	-	Individual Component Repair Listing
IMA	-	Intermediate Maintenance Activity
KB	-	Thousand Bytes
LHA	-	Amphibious Assault Ship (General Purpose)
LPH	-	Amphibious Assault Ship
LPM	-	Lines Per Minute
MB	-	Million Bytes

LIST OF ABBREVAITIONS (Continued)

MC	-	Material Control (Officer)
MTR	-	Mandatory Turn-In Repairable
NC	-	Not Carried
NIS	-	Not In Stock
NORS	-	Not Operationally Ready - Supply
NSN	-	National Stock Number
OMA	-	Organizational Maintenance Activity
S1	-	Ship Supply Support Division
S6	-	Air Supply Support Division
SDE	-	Source Date Entry
SSC	-	Supply Support Center
SUADPS	-	Shipboard Uniform Automated Data Processing System
TYCOM	-	Type Commander
UMMIPS	-	Uniform Material Movement Issue Priority System
UNREP	-	Underway Replenishment
UTILITY ITEM	-	Multi-Purpose Consumable Item (Rags, Grease)
VERTREP	-	Vertical Replenishment
VIDS MAF	-	Visual Information Display System Maintenance Action Form

ABSTRACT

The purpose of the Afloat Information and Material Movement Study (AIMMS) is to determine the relative locations (measured in time), equipment, and manning requirements (configuration), of a new construction aircraft carrier supply support system that will maximize the effectiveness of the system during at-sea operations. The prime objective of the study is to develop a method that can be used as a tool for analyzing the effects on the system of adjusting the characteristics of the configuration.

Phase 1, the initial AIMMS effort, described the supply support and related maintenance processes performed by current aircraft carrier departments.

This Phase 2 report describes:

- the data acquired to quantify the required supply support processes.
- the measure of effectiveness to be used as a basis for evaluations.
- the potential systems that may be considered as substitutes for current inter- and intra-process means of information and material processing and transfer.

ADMINISTRATIVE INFORMATION

The project was authorized by the Weapons System Coordination Branch of the Naval Supply Systems Command (NAVSUP 0341) and was funded by the Research and Technology Division (NAVSUP 043) as part of the Material Technology Block Program at the DTNSRDC.

Program Element 62760N

Task Area TF53531.091

Work Unit 1-1800-007-64.

METRIC EQUIVALENCE

2.54 centimeters = 1 inch

30.48 centimeters = 1 foot

454 grams = 1 pound

INTRODUCTION

BACKGROUND

During Phase 1, of the Afloat Information and Material Movement Study (AIMMS) process descriptions were developed that represent the current information and material actions performed by supply support and related maintenance activities aboard aircraft carriers operating at sea. In addition, Phase 1 analyzed the supply support needs of aircraft carriers. These needs were based on current aircraft carrier supply support organizational structures and on guidance by the Naval Aviation Maintenance Program (NAMP OPNAVINST 4790.2A). The Phase 1 Report* was reviewed and validated by fleet activities and personnel (including personnel aboard the USS NIMITZ, CVN-68, and the USS AMERICA, CV-66).

OBJECTIVES

The Phase 2 Data Acquisition objectives of the AIMMS are:

- to acquire the data that quantifies the processes described in Phase 1.
- to identify and describe the measure of effectiveness that will be used as a basis for evaluations.
- to identify and describe the characteristics of information and material handling systems that have potential for improving the effectiveness of the supply support system.

DATA ACQUISITION

GENERAL

A review of the Phase 1 process descriptors led to the identification of the factors that required quantification. These factors included:

---

* B. Siegel and C. Ash, "Afloat Information and Material Movement Study (AIMMS), Phase 1 - Descriptions of Required Supply Support Processes", DTNSRDC Report 78/106, Nov 1978 (U)

The organizational structure

- S1/S6 supply support divisions
- AIMD divisions
- CAG squadrons
- Engineering Department divisions
- Operations Department divisions
- Air Department divisions

The requisition requirements

- process/activity name
- maintenance (customer) locations
- requisition volumes
- requisition priorities
- information and material type
  - size (standard, bulky)
  - format (VIDS MAF, 1348, etc.)
  - category (repair part, repairable, consumable, BCM, NORS, MTR, EXREP, CASREPT, etc.)

Process/transfer resources*

- type
- number
- location
- day and night shift assignments

Information and material handling times

- storeroom identification
  - material type stored
  - manned and unmanned storerooms
  - locations
  - S1/S6 assignments
- requisition delay times
  - off-ship
  - shipboard

---

* A process resource requires process identification. A transfer resource requires origination and destination identification.

- item availability
  - carried and not carried items
  - in stock and not in stock items
- personnel non-supply support times
  - non-available times (watch assignments, mess, comfort station, UNREP, health care, sleep, GQ and fire drills)
  - administrative times (training, process-area cleaning, etc.)

From a statistical point of view, one or two sets of shipboard data do not in themselves represent either the average or the range of current aircraft carrier requisition requirements. However, the purpose of acquiring these data was to determine "ball park" supply support requirements that could be used as a baseline against which measurements could be made and variations compared. The data acquisition task was performed with the cooperation of the study sponsor (NAVSUP 0341, Weapons System Coordination Branch) and the Type Commands (COMNAVAIRLANT/COMNAVAIRPAC - Code 42, Readiness Divisions).

INITIAL DATA ACQUISITION (USS RANGER)

The initial data acquisition task was undertaken with the permission and support of COMNAVAIRPAC - Code 42. In-port and at-sea visits were requested of, and accepted by, the USS RANGER (CV 61). The in-port visit was scheduled for a period of 10 days. The at-sea visit was to extend over a period of 20 days with an intermediate stop in port for 3 days.

Formats were developed (prior to ship visits) for recording requisition and related factors which were previously identified. Figure 1 is the format used to acquire input, performance, and output process data. The header includes the requisition (document) number of a requested item, the process identification number which corresponds to the process number code used in the synthesized flows developed by the AIMMS team, and the date that the process was observed. The body of the format has three parts. The first part contains the process inputs including a description of the information/material item that is to be processed, the time that the item enters the process area queue,and the means by which the item was transferred. The second part includes the type and number

Requisition (Document) Number _____ Process Identification Number _____ Date _____

Process Inputs

Previous Process Activity (PPA)	Previous Process Ident. Number	Input Item Type		Input Volume	Means of Transfer (from PPA)	Input Time of Arrival	Constraints	Comments
		Info	Material					

Process Performance

Present Process Activity	Resources				Time Required		Constraints		Comments
	Men		Equipment		Process	Admin	Type	Time Start/Stop	
	Spec	No	Type	No	Start/Stop	Start/Stop			

Process Outputs

Next Process Activity (NPA)	Next Process Ident. Number	Output Item Type		Output Volume	Means of Transfer (to NPA)	Output Time of Departure	Constraints	Comments
		Info	Material					

Figure 1 - Process Description

of resources used in performing the process, the observed process time, and the time(s) and cause(s) of delay(s), if any. The last part of the format lists the output factors which are similar to those of the input segment. Because only one AIMMS team member was available to acquire data on transfer times between the supply support processes, and between storeroom and customer (maintenance) destinations, the format shown in Figure 2 was developed. The procedure was for the AIMMS member to fill in the document number, current date, time of departure (of ship's personnel going to acquire and deliver the material being requisitioned), customer destination name, issue storeroom location, and a description of the material to be acquired. The person who was to acquire the requisition was then requested (with the permission of the Supply Officer) to fill in the times that he arrived and departed from the storeroom, and the time of arrival at his (customer) destination. The AIMMS member kept a daily record of each requisition and customer destination. At the end of the day, the AIMMS member would pick up the completed forms at the customer destination.

Again because the number of AIMMS personnel was limited (4), and because the data required were extensive and the number of shipboard locations involved was large, it was decided to acquire ship-related supply support data (S1) during the first 10 days of the at-sea visit and air-related supply support data (S6) during the second 10 days of the visit.

An in-port visit was undertaken by the team to prepare for the at-sea visit aboard the RANGER. The objectives of this visit were to discuss the purpose, objectives, and data requirements of AIMMS with the appropriate S1 and S6 supply personnel with whom the team was to interface during their at-sea visit. The in-port visit allowed the team members to familiarize themselves with the RANGER's supply support procedures and physical configuration, and to review and refine the S1 and S6 synthesized process flows developed from the process patterns prepared during Phase 1.

During the first 10-day at-sea visit, ship-related supply support data (S1) were acquired. These included quantitative values of:

Requisition (Document) Number _____

Date _____

Customer Name _____

Requisition Description

Type _____ _____

Size _____ _____

Weight _____ _____

S1/S6 Process

Location _____

Time Departed _____

Storeroom

Location _____

* Time Arrived _____

* Time Departed _____ _____

Customer Destination

Location _____

Time Arrived _____

*To be filled in by material acquisition person.

Figure 2 - Requisition/Material Movement Times

- inter-user transfer times (process to process, process to storeroom, and storeroom to customer)
- inter-user resource descriptions (men and equipment used to transfer information and material among the supply support system users)
- intra-process times (process performance times; if delays* occurred, they were identified as to type and time)
- intra process resource descriptions (type and number of men and equipment used per 12-hour shift to perform each supply support process)
- requisition descriptions (item type**, volumes, and priorities***

The qualitative data acquired and analyzed during Phase 1, and the quantitative data acquired from the RANGER, enabled the following inputs for the AIMMS logic flow to be prepared:

- requisition source, priority, type, and volume (batch size) distributions
- distributions describing the handling of CASREPT, NORS, EXREP, MTR, AWP, standard/bulky (including outsize) materials, DTO/ storeroom information and material
- maintenance times (times that failed item is not in supply support system)
- information and material transfer times between supply support processes, and between storerooms and customers
- process times (excluding situation delay times such as GQ and fire drills)
- resources used to process and transfer information and/or material

---

* Delays were caused by GQ, fire and man-overboard drills, etc.
** Repair parts, repairables, consumables (utility items); standard, bulky, and outsize items that require material handling equipment.
*** Priority number plus special descriptor (if applicable) such as NORS, CASREPT, etc.

During the data acquisition task aboard the RANGER, the receiving process was rarely performed. When it was performed, the actions did not provide sufficient data. This situation also led to a lack of off-ship requisition response times. Because of these shortages, the following receiving-related data were yet to be acquired:

- transportation category (means by which off-ship requisition are transferred to the ship - COD/HELO, or UNREP)
- date of receipt (of off-ship requisitions)
- document number (which includes requisition, origination date, and customer destination - DTO or storeroom)
- priority number (02,05, 12-see OPNAV Instruction 4614.1E, UMMIPS, 29 July, 1975 (U)) and special designation (NORS, CLAMP, CASREPT, etc), if applicable
- material type (repair part, repairable, standard/bulky)
- receiving process performance time (identification and sorting actions)
- process resource identification (men and equipment)

SUPPLEMENTAL DATA ACQUISITION (USS EISENHOWER)

A request for AIMMS personnel to observe and acquire material receiving process data during at-sea carrier operations was made of COMNAVAIRLANT (Code 42). Code 42 approved the request and consequently contacted the USS EISENHOWER (CVN-69). Permission for the visit was granted by the ship, its task group, and CINCUSNAVEUR. The at-sea visit aboard the EISENHOWER was for a period of 9 days.

An abbreviated version of the Figure 1 format was used to acquire the receiving-related data described in the previous section. One of the team members was assigned to photograph material handling actions related to the receiving process and scenes depicting causes of material handling delays (see Figure 3).

Prior to the actual data acquisition task, designated AIMMS personnel held discussions with appropriate supply personnel and described to them the overall and immediate AIMMS objectives and data requirements. This time was also used to review and further validate the S1 and S6 supply support process flows developed during Phase 1 and refined during

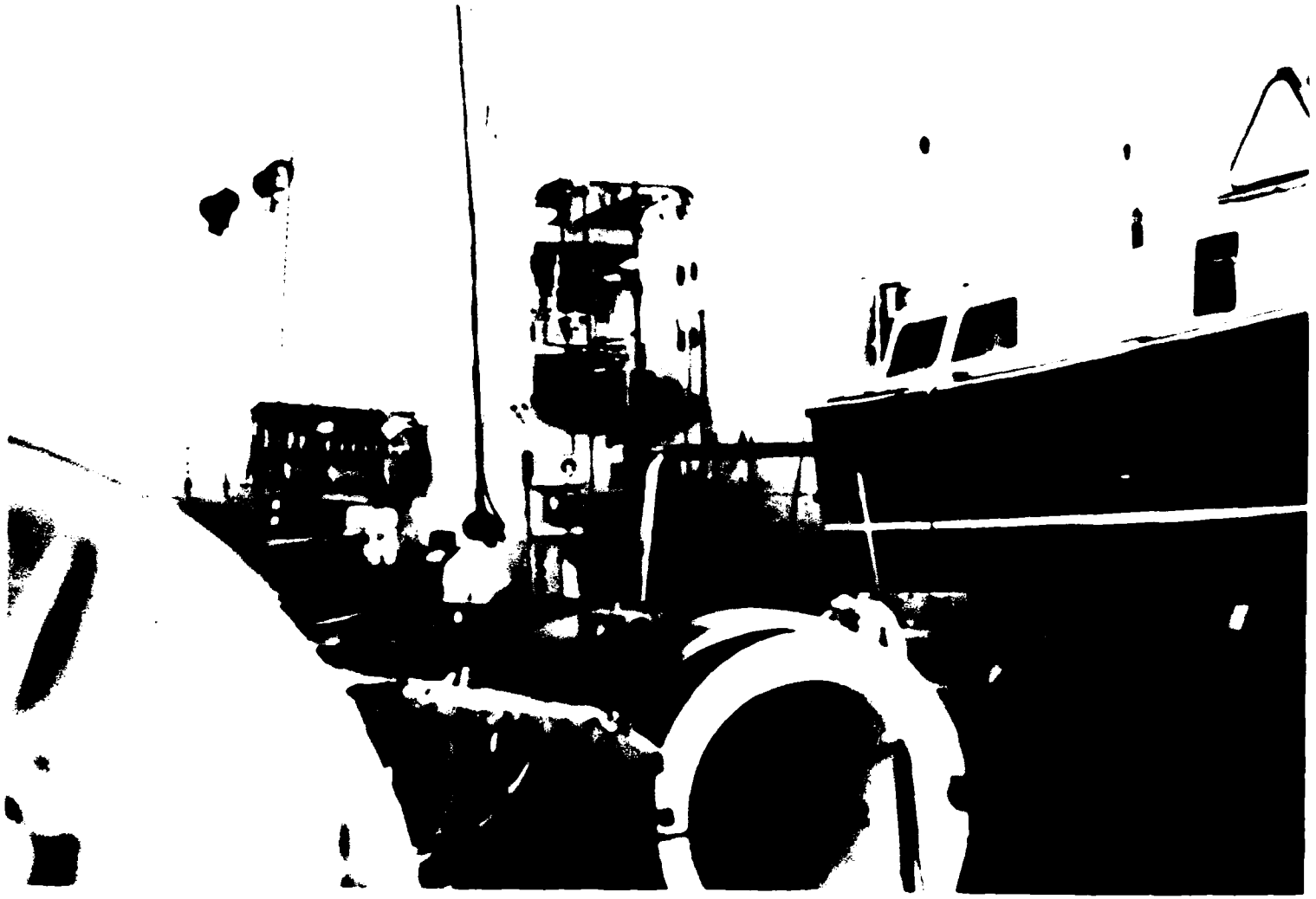


Figure 3 - Receiving Area Access

the RANGER in-port visit. Concurrently, the team members familiarized themselves with the ship's material receiving procedures (COD/Helo and UNREP) and physical configuration.

The acquisition of COD/Helo data was initiated the second day aboard the ship. The distance between the ashore supply terminal and the ship was the key factor in determing whether a COD or Helo type of aircraft was to be used. COD aircraft have a longer range than helicopters. The number of deliveries per day by these aircraft was found to vary between one and five. The characteristics of the data acquired included:

- transportation category
- document number
- process time
- process resources
- material size
- constraints (if any)
- special description (CASREPT, NORS, etc)

Additional data needed included the requisition priority number and material type (such as repair parts or repairables). There were two sources for this supplemental data:

- Receipt Processing System (RPS) - installed aboard the ship for test and evaluation by DTNSRDC
- Master Requisition File (MRQ)

Receiving actions were also observed and data acquired from Underway Replenishment (UNREP). UNREP is the term given to the methods used for keeping deployed ships on station at a desired state of readiness. Ships that perform this resupply function for units in the 6th Fleet are known as the Mobile Logistic Support Force (MLSF). These support ships carry cargoes of items tailored to the force they support and supplement the fleet's endurance by providing fuel, ammunition, provisions, repair parts, consumables, and certain insurance items (critical to system operation). In the 6th Fleet, a major UNREP is scheduled approximately every 30 days. The AIMMS team visit to the EISENHOWER was purposely scheduled during a major UNREP. Prior to the UNREP, a Strikedown Plan was prepared and briefed to the participating crew members. AIMMS members attended these meetings. The Plan specified the locations of

the stores-receiving stations (including the material to be received), supervisory responsibilities, station-manpower requirements, material-staging areas, and traffic flow patterns. It also indicated personnel assignments, duty-station reporting times, responsibilities, manpower organizations, procedures to be followed, UNREP initiation and conclusion times, and the means of ship to ship transfer (Connected Replenishment-CONREP; and Vertical Replenishment-VERTREP). When support and recipient ships are connected by means of rigged lines while moving in parallel positions at the same speed, the replenishment procedure is known as CONREP. When material is transferred from a support ship to a recipient ship by means of helicopters, the procedure is known as VERTREP. The bulk of transferred material is usually provisions. Approximately 600 pallets were scheduled to be delivered within a six-hour period during the AIMMS team at-sea visit aboard the EISENHOWER.

Prior to the UNREP, almost all the aircraft that were in various stages of maintenance on the hangar deck were transferred to the forward area of the flight deck to facilitate the movement of the fork lifts that would be transferring pallets from the elevator (VERTREP) and receiving stations (CONREP) to deconsolidation locations*. From these locations packages were placed on package conveyors that serviced the various storeroom areas. The UNREP data acquired included:

- transportation category
- document number
- process time
- process resources
- priority number and designation
- material type
- material size
- constraints (if any)
- special description (CASREPT, NORS, etc.)

---

* Locations at which bands are removed from a pallet and the individual packages of which it is composed are removed and identified.

No additional data were needed to supplement the receiving process information acquired during the UNREP operation.

After the visit to the EISENHOWER, the acquired COD/Helo (including the supplemental RPS and MRQ data) and UNREP data were analyzed and categorized. The analysis provided

- off-ship requisition response time
- receiving process resource identification
- material description (type and size)
- material destinations (DTO/storeroom)

STOREROOM ACCESS AND MATERIAL TRANSFER DELAY TIMES

The delays incurred from the time a requisition for the issuance of material is presented at a storeroom until the time it is delivered at the maintenance customer's location are often significant. These time delays have been identified and quantified for the supply support configuration to be used for the AIMMS baseline case, and grouped. The first group, Storeroom Access Delay, is caused by a combination of factors such as material type/size/ weight, location/size of storeroom doors/hatches, storeroom space utilization (internal storeroom accessibility is included in this group), storeroom location*, and availability of appropriate material handling equipment (see Tables 1 and 2). The second group, Material Transfer Delay, is generally a function of material type/size/ weight, availability of appropriate material handling equipment, and flow path impediments (see Tables 3 and 4). S1 and S6 codes, locations, indices, and customer users were those of the USS RANGER. The data were acquired from discussions with personnel from the carriers visited by the AIMMS team during Phases 1 and 2, and from actual observations made during the visits aboard the RANGER and EISENHOWER.

MEASURE OF EFFECTIVENESS (MOE)

The MOE that will be used as the basis for evaluating the effectiveness of the supply support system will be response time. This time

---

* If a storeroom is located under the hangar deck, it might be necessary to move parked aircraft in order to gain access to it.

TABLE 1 - S1 STOREROOM ACCESS DELAY TIMES

Storerooms		Access Delay Time (Average-Measured in Minutes)
Code	Location Level - Deck Frame	
A	1 - 005	12
B	3 - 012	2
C	4 - 012	2
D	3 - 019	2
E	3 - 132	standard - 2, outsize - 17
F	4 - 019	2
K	4 - 106	standard - 30, outsize - 120, 240
Q	3 - 215	standard - 60, outsize - 120
V	4 - 192	standard - 30, outsize - 120
X	4 - 244	2
Z	7 - 215	2

TABLE 2 - S6 STOREROOM ACCESS DELAY TIMES

Storerooms		Access Delay Time (Average-Measured in Minutes)
Code	Location Level - Deck Frame	
603	01 - 149	1
604	01 - 127	standard - 3, bulky - 60
512	4 - 069	60
621	4 - 215	60, 720
622	5 - 215	3

TABLE 3 - S1 MATERIAL TRANSFER DELAY TIMES

(Measured in minutes)

DSPO		Storerooms										
Name	Index	A	B	C	D	E	F	K	Q	V	X	Z
V1	17	15	15	18	15	30	18	30	240	30	18	27
V2	18	15	15	18	15	30	18	30	240	30	18	-
V3	19	5	9	12	9	30	12	20	240	20	12	21
V4	20	-	-	18	15	30	18	-	240	30	-	27
OE	21	-	-	18	15	-	18	30	-	-	-	-
OA	22	15	15	18	15	30	18	30	240	30	18	27
OC	23	15	15	18	15	30	18	30	240	30	18	27
OI	24	15	15	18	15	30	18	30	240	30	18	27
OZ	25	5	9	12	9	30	12	20	240	20	12	21
A	26	10	-	3	-	-	3	-	-	5	-	12
E	27	5	9	12	9	30	12	20	240	20	12	21
P	28	5	3	6	3	30	6	10	240	10	6	15
R	29	-	-	3	-	-	3	-	-	5	3	-

TABLE 4 - S6 MATERIAL TRANSFER DELAY TIMES

(Measured in minutes)

MC Name	Index	Storerooms				
		603	604	612	621	622
VF - 154	1	6	10	30	240	21
VF - 21	2	6	10	30	240	21
VA - 25	3	3	5	15	240	12
VA - 113	4	3	5	25	240	18
VA - 145	5	-	-	20	240	15
C1A	6	3	5	15	240	12
VAQ - 137	7	6	10	10	240	9
RVAN - 7	8	3	5	20	240	18
HS - 4	9	6	10	30	240	21
VAW - 17	10	6	10	10	240	9
VS - 29	11	6	10	10	240	9
HC - 11	12	6	10	30	240	21
050	13	3	5	15	240	12
DM2	14	3	5	15	240	12
IM3	15	-	-	20	240	15
IM4	16	3	5	15	240	12

will be measured from the time that the initial requisition is introduced to an appropriate (S1 or S6) process until the time that the requested material is delivered to the requisitioning activity. It does NOT include the interim delay times during which information and/or material is being processed or transferred within or between shipboard maintenance or ashore requisition activities (see Figure 4). Reducing these times is not within the scope of this study and is not within the control of the shipboard supply support system.

The response times of adjusted supply support system configurations can be compared with the baseline configuration which was quantified primarily during the RANGER* data acquisition task. The advantages and disadvantages of the changes made in the adjusted configurations could then be analyzed.

PROCESS FLOW VALIDATION

The supply support synthesized patterns of performance developed in Phase 1 of the AIMMS study were combined into overall S1 and S6 process flows. These process flows were then refined and validated by the ship and shore activities visited by the AIMMS team during the Phase 2 data acquisition task. These activities included:

USS RANGER (CV-61)
USS EISENHOWER (CVN-69)
NAVAIRLANT HQ (Code 42)
NAVAIRPAC HQ (Code 42)

* Receiving process and off-ship requisition delay time data were acquired from USS EISENHOWER observations.

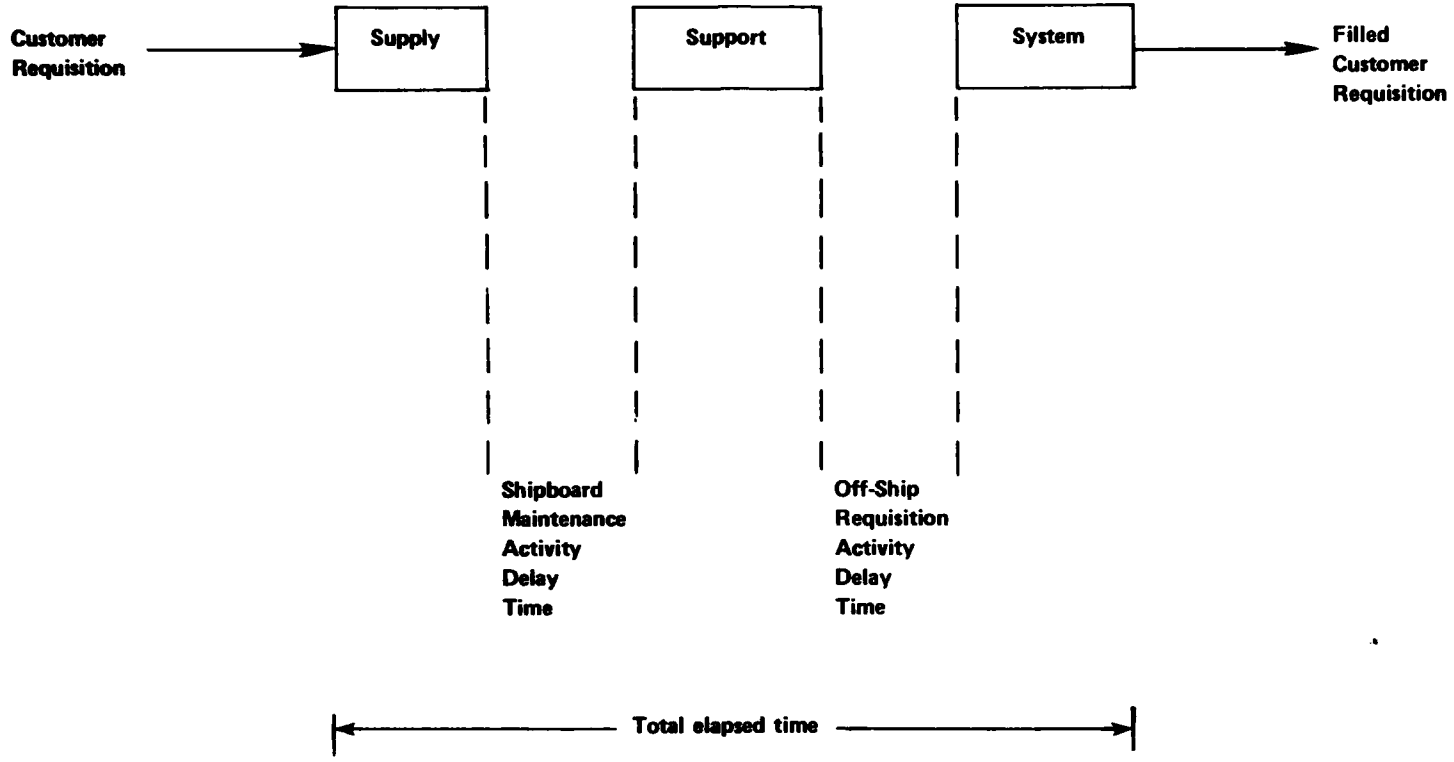


Figure 4 - Supply Support System Response Time

POTENTIAL SYSTEMS

GENERAL

In this study, potential systems are defined as those systems which may be used to improve present supply support material and/or information handling between, and within, supply and maintenance activities. Another means of improving the supply support system would be to decrease the times that items are found to be NIS. Frequently, material received aboard the ship is not sent to the designated storeroom/location. (This problem is currently being addressed by the Logistics Marking System (LOGMARS), a study being performed at DTNSRDC. When the LOGMARS study is complete, its findings and procedures may be reviewed and considered by AIMMS.) Finally, analyzing and adjusting the AVCAL or COSAL of a carrier to reduce the NC responses for a significant number of requisitions could improve the supply support system. (This procedure is beyond the scope of this study and will not be addressed by AIMMS.)

Systems that may be considered by AIMMS are those which have been approved, or are being considered, for installation aboard U.S. Navy ships. The systems that the sponsor or TYCOM consider to offer potential improvement to the supply support system will be addressed by AIMMS. AIMMS evaulations will determine whether such systems have the capability to improve the effectiveness of the supply support system of newly designed aircraft carriers. The potential systems that may be evaluated need not be limited to those described in this report.

A materials handling configuration that may be evaluated by AIMMS is composed of the structurally built-in equipment being considered for the CVV aircraft carrier. This equipment includes an Aircraft Engine and Stores Elevator, a Dumbwaiter, Stores Elevators, and Package Conveyors. These types of equipment are not new and are currently being used on other ships.

The information handling systems that may be considered are:

The Naval Aviation Logistics Command Management Information System (NALCOMIS) which has been designated for CV, LPH, and LHA types of ships

The Shipboard Non-Tactical Automated Data Processing System (SNAP 1) which is designated for CV, LPH, AS, AR, AFS, and AD types of ships

NALCOMIS (Module 1) and SNAP 1 (Phase 2) have been configured (but have not been implemented) for shipboard test and evaluation.

Characteristics of these potential systems are presented in Tables 5 and 6. These characteristics were selected because of their influence on requisition response times.

Potential system data were sought from:

NAVAIRLANT (Code 42).
NAVSEASYSCOM (Code 5121).
NAVAIRSYSCOM (PMA 270).
NAVSUPSYSCOM (FOSAT).
NAVMAT (MAT 04P).

MATERIAL HANDLING EQUIPMENT

The structurally built-in supply materials handling equipment* proposed for the CVV Aircraft Carrier includes an aircraft (A/C) engine and stores elevator, three stores elevators, a dumbwaiter, and four package conveyors. Materials handling equipment is used to move supply items that are too heavy to be handcarried. These types of equipment are commonly found aboard aircraft carriers. However, AIMMS will evaluate this equipment because its unique proximity to supply support storeroom and customer activities provides potential for expediting the movement of material among them. The potential advantages of this configuration are:

(1) improved resource efficiency.

(2) minimized requisition turn-around time.

Figure 5 indicates the CVV initial design locations for material handling equipment and storerooms. A selected set of characteristics for each type of equipment is given in Table 5.

---

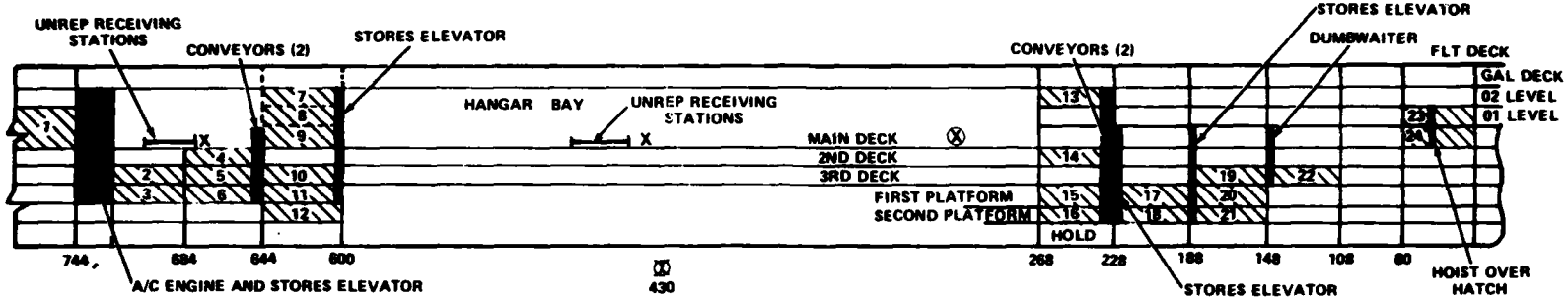
* Mobile material handling equipment such as fork-lifts, dollies, etc., also carry supply items that are too heavy to be hand carried but are not used in any unique manner.

TABLE 5 - MATERIAL HANDLING CHARACTERISTICS

System Name	Application	Capacity (wt/size)	Handling Rate	Reliability	Safety Problem	Space Requirement	Manpower Required	Constraints
A/C Engine and Stores Elevator	Vertical handling of aviation material	10K lb/ 7.5'×17.5'	10'/min	NA	UNK	20.5'×10.5' ×55'	2 men (one at origination location, one at destination location)	Entrance blocked by aircraft on hangar deck
Stores Elevator	Vertical handling of aviation material	4K lb/ 6'×4'	60'/min	NA	UNK	7'×5'×56.25' (1) 7'×5'×40' (2)	2 men (one at origination location, one at destination location)	Entrance blocked by aircraft on hangar deck
Dumbwaiter	Any aviation supply material		60'/min	NA	UNK	4'×5'×29'		None
Package Conveyor	Material movement to storerooms		12pkg/min	NA	UNK	4'×5'×32' (aft) 4'×5'×58' (fwd)	4 men (two at each end)	Oversized packages (greater than 100 lb)

TABLE 6 - INFORMATION SYSTEM HANDLING CHARACTERISTICS

System Name	Application	System Capacity	Handling Rate	Reliability	Space Requirement	Manpower Requirement	Input Format	Output Format	Data/Message Length	Transfer Time	Constraints
SNAP 1/ NALCOMIS	Information processing and distribution	265 KB 1 MB	3 sec (response time)	NA	15.5' ×10.5'	One man/ station	Unrestricted	Printed page, CRT display	Unrestricted	Up to 9600 baud	Humidity range, 10-90%; Temp Range, 10°-37° (C)



(1) JET ENGINE SHOP
(2) AIRCRAFT ENGINES (CANNED)
(3) S.D. STORE (AVIATION)
(4) GALLEY AND MESS ROOM
(5) DRY PROVISIONS
(6) FREEZE AND CHILL ROOM
(7) SHIP STORE
(8) AIRCRAFT TIRES AND WHEELS
(9) AIRCRAFT TIRES AND WHEELS
(10) H.M. AND E. SHOPS
(11) S.D. STORE AND SEAMART
(12) S.D. STORE
(13) OFFICER GALLEY
(14) GALLEY AND MESS ROOM
(15) DRY PROVISIONS
(16) FREEZE AND CHILL ROOM
(17) AVIATION FLAMMABLE
(18) FLAMMABLE LIQUID
(19) MAIN ISSUE ROOM
(20) S.D. STORE (BULK)
(21) S.D. STORE (BULK)
(22) SHIP STORE
(23) S.D. STORE (AVIATION)
(24) GAS CYLINDERS

Figure 5 - Initial CVV Design Configuration

The A/C engine and stores elevator has the greatest flexibility of all the shipboard vertical systems in handling diversified cargo loads. It is located in the aft part of the ship adjacent to frame 744 and operates from the first platform up to the 01 level. At this location, the elevator can serve the aviation storeroom (first platform), aircraft engine storeroom (third deck), and UNREP receiving station (main deck). These activities are vertically located in the order given.

There are three stores elevators. The capacity of this type of elevator is much smaller than that of the aircraft engine and stores elevator. The stores elevators are located and operated as follows:

1. Elevator #1 is located at frame 188 and operates from the second platform to the main deck. It serves the storerooms which contain bulky items (first and second platform) and the Main Issue storeroom (third deck).

2. Elevator #2 is located at frame 228 and operates the same as #1. It serves the flammable liquid store (second platform) and the aviation flammable storeroom (first platform).

3. Elevator #3 is located at frame 600 and operates from the first platform to the 03 level. It serves four storerooms and a work shop.

A dumbwaiter is located at frame 148. It operates from the third deck to the main deck. The dumbwaiter serves one storeroom.

The CVV aircraft carrier has four package conveyors. Two are located at frame 228 and two at frame 644. The conveyors consist of trays suspended on two electrically powered endless chains. Packages can be loaded and off-loaded simultaneously at desired levels. The two forward conveyors operate from the second platform to the 02 level. The two aft conveyors operate from the first platform to the main deck.

Reliability and safety are of great concern. However, data for these characteristics are not available at this writing.

INFORMATION HANDLING SYSTEMS

NALCOMIS is a management information system conceived to support the Naval Aviation Maintenance Program envisoned for the 1980s. The overall objective of NALCOMIS is to contribute to improved aircraft material

readiness by providing maintenance and material managers at the organizational and intermediate supply support levels with modern responsive management information system capabilities.

The pricipal hardware units are a central processing unit (CPU), terminals, and printers - each of which has peripheral equipment. The CPU will be located in the SUADPS area alongside the SUADPS equipment (SNAP 1). The NALCOMIS CPU will be the same type of equipment as SNAP I. They will provide backup service for each other. The common peripherals of NALCOMIS and SNAP 1 include a controller, high speed printer, card reader/puncher, tape controller, and tape device. The system will have terminal-printer groups which will be located as required (see Figure 6). The advantage in having separately installed NALCOMIS equipment is that it can provide service to activities which do not have SNAP 1. At present, the NALCOMIS data base is envisioned to contain only aviation data. A selected set of NALCOMIS characteristics is presented in Table 6.

The following NALCOMIS capabilities offer potential advantages to aviation supply support:

- The capability for the customer to query for storeroom supplies, thus eliminating time used for requisitioning items that are later found to be NIS/NC.

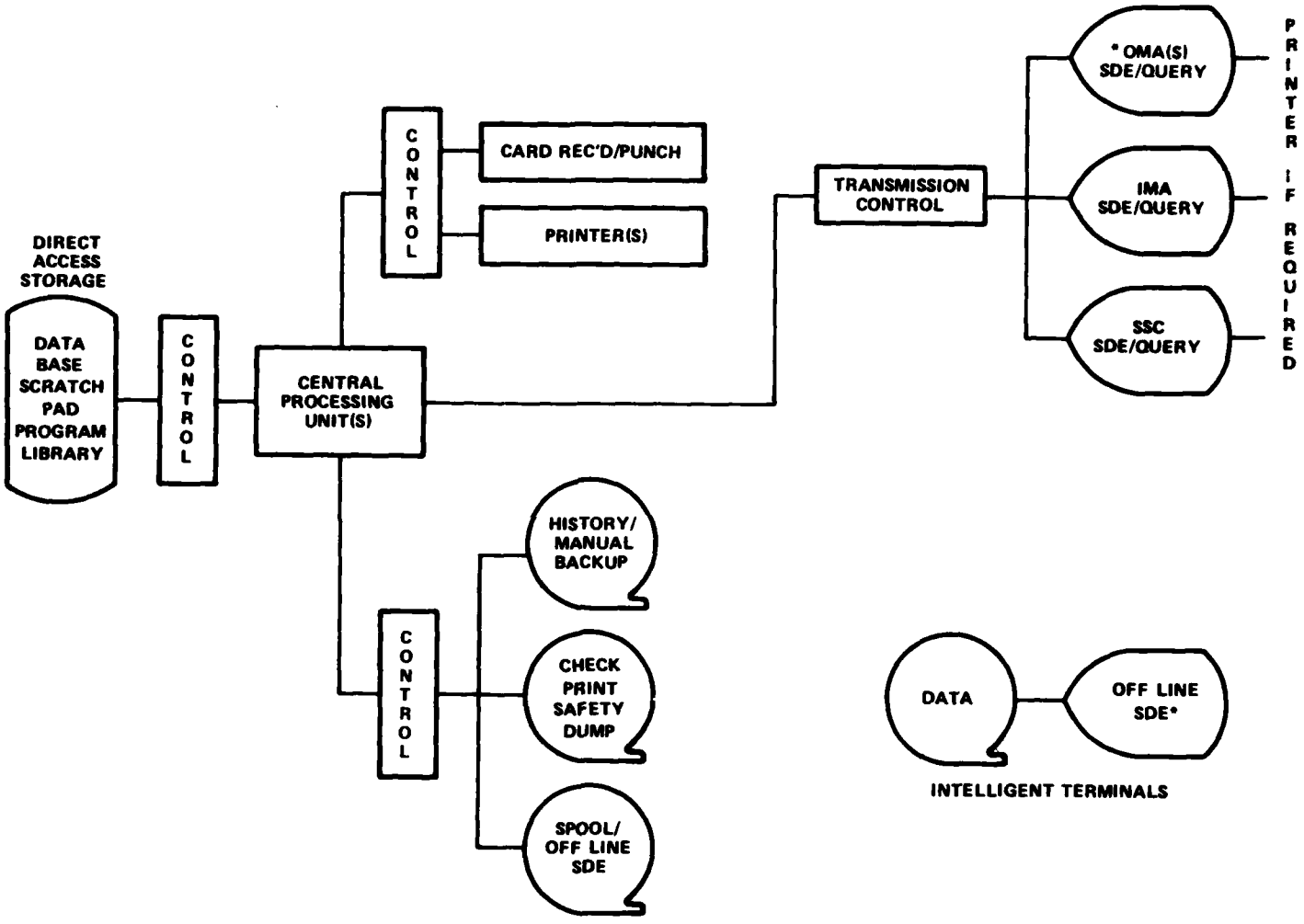
- A display terminal which indicates hi-low supply levels, thus eliminating the bulky and time-consuming manual processing currently required by Stock Control personnel to determine items for reorder.

- The ICRL with automatic cross-reference and interchangeability identification information, thus eliminating the time-consuming manual process within the Technical Station.

- ADP equipment to decrease human errors and manual paper handling.

- Real time information transfer, thus minimizing the time required to transfer information between points separated by significant distances (such as Receiving and Stock Control).

- An item audit trail, thus reducing inventory loss of components and time delays due to item misplacement.



*NUMBER WOULD VARY BY SIZE, MISSION, AND SITE.

Figure 6 - NALCOMIS System Hardware Schematic

SNAP 1 is a modern modularly expandable automatic data processing system, designed to replace the present AN/UYK-5 aboard large ships including aircraft carriers. The system is designed to enhance logistics support, thus upgrading fleet readiness. A meaningful attribute of SNAP 1 is that it is expected to provide teleprocessing and on-line storage capabilities sufficient to support major existing and planned applications which relate to such functional areas as maintenance, material management, and supply in a real time mode. The SNAP 1 hardware configuration is given in Figure 7. SNAP 1 can interface with both present and planned ADP systems.

AIMMS will evaluate SNAP 1 as a potential system that could offer advantages to the Supply Support System. These potential advantages include:

- Automated requisitioning - eliminating time required for manual requisition preparation and handcarry to the Supply Response Section.
- Cross referencing items by NSN and part number, and determining interchangeables - eliminating time required for manual processing by Technical Station personnel.
- Transferring receipts between Receiving and Stock Control - eliminating handcarry.
- Determining designated overhaul point - eliminating time required for manual processing by shipping personnel.
- Determining item availability - eliminating the present time-consuming method which requires action by both the customer and supply support personnel.
- Automatic requisition tracking - offering status information upon request.

A selected set of SNAP 1 system characteristics is presented in Table 6.

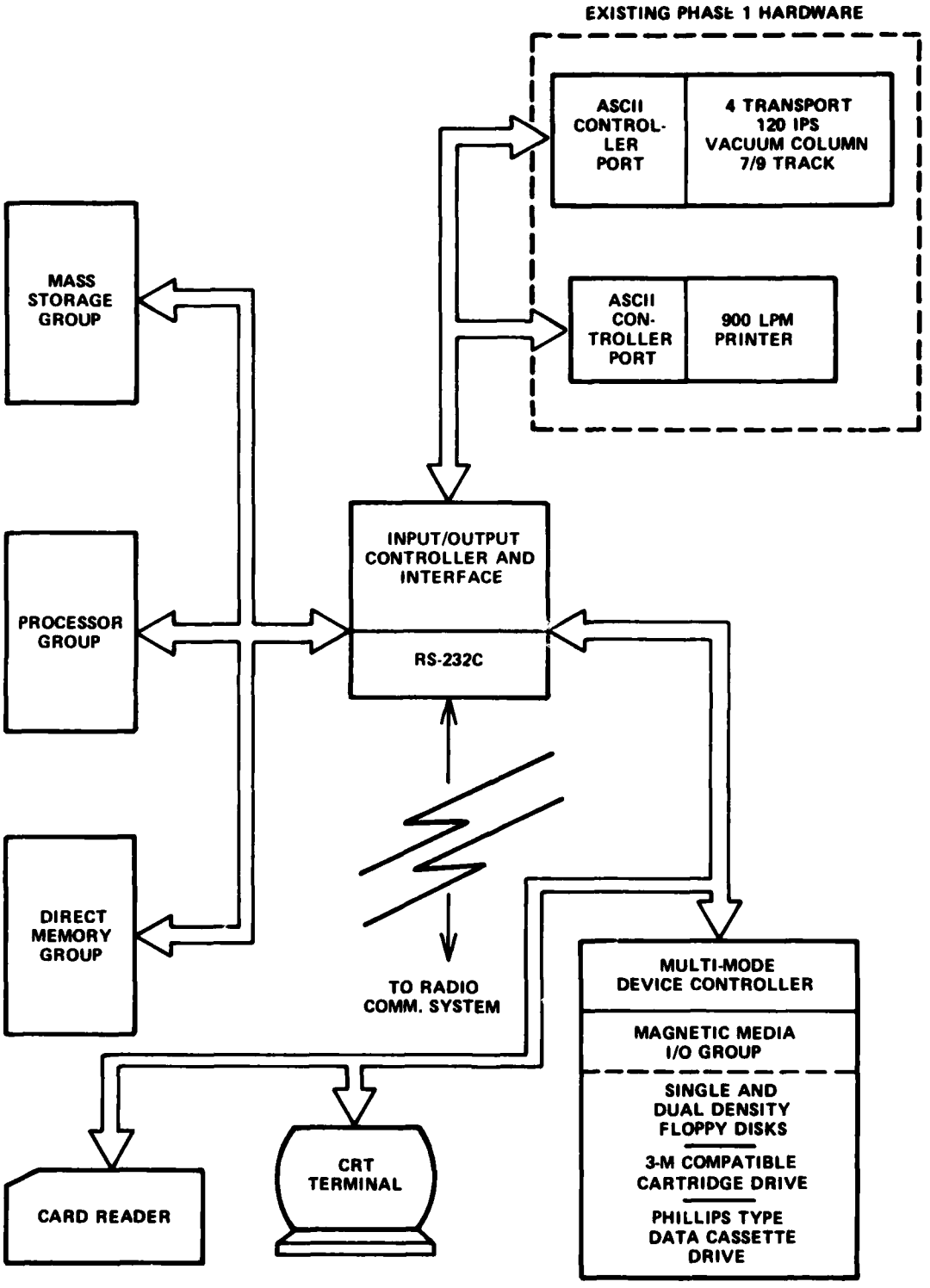


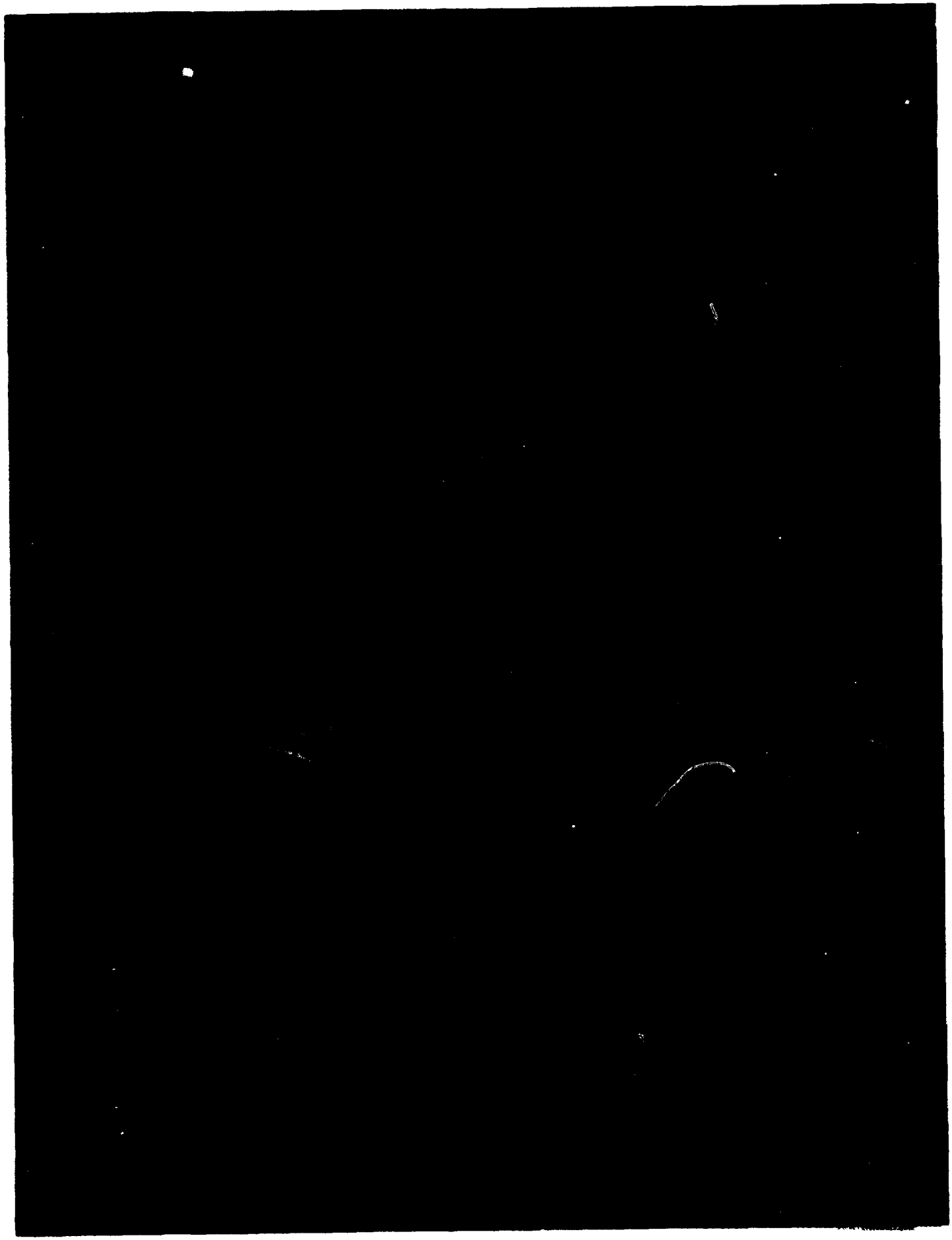
Figure 7 - SNAP 1 System Configuration

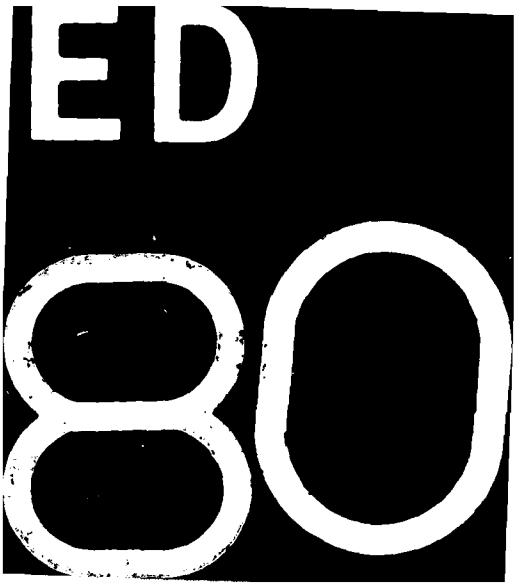
INITIAL DISTRIBUTION

Copies	
2	DLSIE
2	COMNAVAIRLANT/CODE 42
2	COMNAVAIRPAC/CODE 42
2	NAVMAT 1 MAT 08D246 1 MAT 09A
10	NAVSUP 1 SUP 04A 2 SUP 0341 7 SUP 043
3	NAVSEA 1 SEA 313 1 SEA 321 1 SEA 512
1	FMSO/CODE 83
1	NSC - FOSAT/FSOD
1	USS RANGER (CV-61)
1	USS EISENHOWER (CVN-69)
12	DTIC

CENTER DISTRIBUTION

Copies	Code	Name
1	1800	G. H. Gleissner
2	1809.3	D. Harris
1	187	M. Zubkoff
10	187	B. Siegel
10	5211.1	Reports Distribution
1	522.1	Unclassified Library (C)
1	522.2	Unclassified Library (A)




ED
80